

**REMARKS**

This amendment is being filed in response to the Official Action dated May 21, 2002 for the above-referenced patent application. Applicants enclose herewith a petition for a one-month extension of time for filing this response. By the current amendment, Claim 1 has been cancelled and replaced by new Claim 6, while Claims 2-5 have been amended.

The Examiner first objected to the specification, stating that an abstract of the disclosure is required on a separate sheet. Applicants respectfully request that the Abstract enclosed herewith on a separate sheet be added to the present application for consideration. This Abstract finds support in the abstract of the International Application (Serial Number PCT/KR99/00687) of which this application is a national stage application, as well as in the specification as originally filed. Thus, Applicants respectfully submit that the Abstract enclosed herewith presents no new matter.

Next, the Examiner objected to the claims and the specification, noting that the terms "General Formula 1" and "General Formula 2" as well as other terms or headings are enclosed in brackets in Claim 1 and throughout the specification. Applicants respectfully submit that the amendments noted above to the specification overcome the objections raised by the Examiner. Likewise, Applicants submit that the cancellation of Claim 1 and the inclusion of new independent Claim 6 overcomes the claim objections. Additionally, Claim 5 has been amended to incorporate, *inter alia*, the Examiner's suggestion for replacing the word "putting" with the term "applying."

Claims 1-5 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of U.S. Patent No. 5,278,178 to Hsu and Soviet Union Patent No. 1687261 to Gembitskii et al. (hereinafter referred to as "SU '261"). With respect to the disclosure of Hsu, the Examiner states that although Hsu does not teach the instant combination of 3-isothiazolone and polyhexamethyleneguanidine phosphate, Hsu suggests that a combination of 2 isothiazolones and other antimicrobial compounds results in a synergy, which affords a more effective and broader control of microorganisms.

With respect to SU '261, the Examiner states that this patent teaches the use of polyhexamethyleneguanidine gluconate as an active component in a disinfecting composition. The Examiner goes on to state that it would have been obvious to one having ordinary skill in the art to combine the polyhexamethyleneguanidine gluconate of SU '261 with the isothiazolone compounds of Hsu because both documents teach compositions containing antimicrobial compounds for disinfecting or preventing microbial contamination. Although the Examiner acknowledges that SU '261 does not disclose the use of polyhexamethyleneguanidine phosphate as recited in instant Claim 6, the Examiner summarizes the § 103(a) rejection, stating that absent any criticality, one of ordinary skill in the art would have expected the same antimicrobial effect with any salt of polyhexamethyleneguanidine (for example, the phosphate salt taught by instant Claim 6 and the gluconate salt taught by SU '261).

Applicants respectfully submit that the instantly claimed invention is

patentable over the combination of Hsu and SU '261. First, Applicants assert that the use of polyhexamethyleneguanidine phosphate in the biocide composition of the present invention is critical as compared to the use of polyhexamethyleneguanidine gluconate in a disinfecting composition, as disclosed by SU '261. As set forth in the enclosed Declaration Under 37 C.F.R. § 1.132 of co-inventor Ki-Seung Choi ("Choi Declaration"), polyhexamethyleneguanidine phosphate has antibiotic ability that is surprisingly and unexpectedly greater than the antibiotic ability of polyhexamethyleneguanidine gluconate.

Specifically, when the antibiotic abilities of each of these compounds were tested to determine the minimum inhibitory concentration (MIC) necessary for inhibiting the presence of certain microorganisms (*see* Choi Declaration, ¶ 9), the results showed that the antibiotic ability of polyhexamethyleneguanidine phosphate, which is used in the biocide composition of the present invention, is significantly higher than that of polyhexamethyleneguanidine gluconate, which is disclosed as an ingredient in a disinfecting composition by SU '261. For example, the MIC of polyhexamethyleneguanidine phosphate necessary to inhibit the presence of microorganisms such as *E. coli*, *K. pneumonia*, and *P. vulgaris* was shown to be about 8-16 times less than the MIC of polyhexamethyleneguanidine gluconate necessary to inhibit the same microorganisms. (*See* Choi Declaration, ¶ 10.) These results show that polyhexamethyleneguanidine phosphate has antibiotic ability that is surprisingly and unexpectedly greater than the antibiotic ability of polyhexamethyleneguanidine gluconate. (*See* Choi Declaration, ¶ 11.)

Thus, the use of polyhexamethyleneguanidine phosphate in the biocide composition of the present invention is critical to the invention described herein. Because of the criticality of the use of polyhexamethyleneguanidine phosphate (rather than gluconate) in conjunction with 3-isothiazolone to make the biocide composition of the present invention, Applicants respectfully submit that it would not have been obvious to one having ordinary skill in the art to combine the mixture of isothiazolones disclosed by Hsu with the polyhexamethyleneguanidine gluconate described by SU '261 to arrive at the presently claimed biocide composition which comprises 3-isothiazolone and polyhexamethyleneguanidine phosphate.

Claims 1-5 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Hsu and SU '261 and further in view of Japanese Patent No. 10175809 (hereinafter referred to as "JP '809"). The Examiner states that JP '809 discloses industrial antimicrobial compositions, which comprise isothiazolones and polyhexamethylenebiguanidine hydrochloride and that the disclosure suggests that the synergistic composition disclosed therein is effective against bacteria, fungi, yeast, algae and actinomycetes. The Examiner goes on to state that although JP '809 teaches a hydrochloride salt of polyhexamethylenebiguanidine rather than polyhexamethyleneguanidine phosphate (as taught by instant Claim 6), absent any criticality, one having ordinary skill in the art would have expected the same antimicrobial effect with any salt of polyhexamethyleneguanidine.

Applicants respectfully submit that the claims of the present invention are

patentable over the combination of Hsu and SU '261 and further in view of JP '809.

Specifically, the properties of polyhexamethylenebiguanidine hydrochloride (disclosed by JP '809) are quite different from the properties of polyhexamethyleneguanidine phosphate, which is present in the instantly claimed biocide composition. For example, polyhexamethyleneguanidine phosphate has no stimulus to the skin, while polyhexamethylenebiguanidine hydrochloride does produce a stimulus when in contact with the skin. Thus, the handling of polyhexamethyleneguanidine phosphate is easier for a user, whereas a user typically must pay close attention to not allow skin to come into contact with polyhexamethylenebiguanidine hydrochloride.

Furthermore, polyhexamethyleneguanidine phosphate, which is present in the biocide composition of the present invention, has a pH stability range of from about 1 to about 10, whereas polyhexamethylenebiguanidine hydrochloride, described by JP '809, is only stable in a pH range of from about 4 to about 10. Thus, a biocide composition made according to the present invention remains stable under conditions that are more strongly acidic than a biocide composition made using the polyhexamethylenebiguanidine hydrochloride disclosed by JP '809. This property of pH stability would allow the biocide composition of the present invention to be used in a wider range of applications, such as in an industrial cooling tower, where strong acid is typically employed.

Likewise, polyhexamethyleneguanidine phosphate is more thermally stable than polyhexamethylenebiguanidine hydrochloride. For example, polyhexamethyleneguanidine phosphate is typically stable at temperatures of up to about

200°C, whereas polyhexamethylenebiguanidine hydrochloride has poor thermal stability.

Thus, biocide compositions made in accordance with the present invention are viable in applications where higher temperatures are typically encountered, and a biocide composition according to the present invention may be kept at a wider range of temperatures. Conversely, a biocide composition made with polyhexamethylenebiguanidine hydrochloride will be limited in the applications in which it is useful and must be maintained at a narrower range of temperatures because of the relatively poor thermal stability of its key component.

Additionally, the cost of a biocide composition made in accordance with the present invention is typically lower than the cost of a biocide composition made with polyhexamethylenebiguanidine hydrochloride because polyhexamethyleneguanidine phosphate is less expensive than polyhexamethylenebiguanidine hydrochloride.

Furthermore, Applicants respectfully submit that the use of polyhexamethyleneguanidine phosphate in the biocide composition of the present invention exhibits criticality when compared to the use of polyhexamethylenebiguanidine hydrochloride in an industrial bactericidal composition. As set forth in the Choi Declaration, polyhexamethyleneguanidine phosphate has antibiotic ability that is surprisingly and unexpectedly greater than the antibiotic ability of polyhexamethylenebiguanidine hydrochloride.

Specifically, when the antibiotic abilities of each of these compounds were tested to determine the MIC necessary for inhibiting the presence of six different types of

microorganisms (*see* Choi Declaration, ¶ 14), the results showed that the antibiotic ability of polyhexamethyleneguanidine phosphate, which is used in the biocide composition of the present invention, is significantly higher than the antibiotic ability of polyhexamethylenebiguanidine hydrochloride, disclosed by JP '809. For example, the MIC of polyhexamethyleneguanidine phosphate necessary to inhibit the presence of the six various microorganisms tested was shown to be up to about 8 times less than the MIC of polyhexamethylenebiguanidine hydrochloride necessary to inhibit some of the same microorganisms. (*See* Choi Declaration, ¶ 14.) These results show that polyhexamethyleneguanidine phosphate has antibiotic ability that is surprisingly and unexpectedly greater than the antibiotic ability of polyhexamethylenebiguanidine hydrochloride.

Thus, the use of polyhexamethyleneguanidine phosphate in the biocide composition of the present invention is critical to the invention described by the present application. Because of the criticality of the use of polyhexamethyleneguanidine phosphate (rather than polyhexamethylenebiguanidine hydrochloride) in conjunction with 3-isothiazolone to make the biocide composition of the present invention, Applicants respectfully submit that it would not have been obvious to one having ordinary skill in the art to combine the mixture of isothiazolones disclosed by Hsu with either the polyhexamethyleneguanidine gluconate described by SU '261 or the polyhexamethylenebiguanidine hydrochloride described by JP '809 to arrive at the presently claimed biocide composition which comprises 3-isothiazolone and

polyhexamethyleneguanidine phosphate.

In summary, although polyhexamethyleneguanidine phosphate (used in the biocide composition of the present invention) is structurally similar to polyhexamethyleneguanidine gluconate and polyhexamethylenebiguanidine hydrochloride (disclosed by SU '261 and JP '809, respectively), these three compounds have different chemical and physical properties, such that a biocide composition including polyhexamethyleneguanidine phosphate according to the present invention provides unexpected effects and advantages, which are not obtained from biocide compositions including polyhexamethyleneguanidine gluconate or polyhexamethylenebiguanidine hydrochloride. Thus, Applicants respectfully submit that Claims 2-6 now pending in the present application are patentable under 35 U.S.C. § 103(a) over the combination of U.S. Patent No. 5,278,178 to Hsu and Soviet Union Patent No. 1687261 to Gembitskii et al. and further in view of Japanese Patent No. 10175809.



Attached hereto is a marked-up version of the changes made to the specification and the claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Tara E. Agnew', is written over a horizontal line.

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PATENT

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Specification:**

The heading at page 4, line 10 has been amended as follows:

{General Formula 1}

The heading at page 4, line 13 has been amended as follows:

{General Formula 2}

The heading at page 5, line 15 has been amended as follows:

{General Formula 1}

The heading at page 5, line 17 has been amended as follows:

{General Formula 2}

The heading at page 7, line 7 has been amended as follows:

{EXAMPLES 1-6}

The heading at page 7, line 28 has been amended as follows:

{Table 1}

The heading at page 8, line 19 has been amended as follows:

{TEST EXAMPLE 1 AND COMPARATIVE EXAMPLE 1}

The heading at page 9, line 10 has been amended as follows:

{Table 2}

The heading at page 9, line 19 has been amended as follows:

{TEST EXAMPLE 2 AND COMPARATIVE EXAMPLE 2}

The heading at page 10, line 7 has been amended as follows:

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{Table 3}

The heading at page 10, line 13 has been amended as follows:

{Table 4}

The Abstract that is enclosed herewith has been inserted into the application as a separate page.

**In the Claims:**

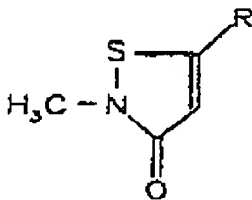
Claim 1 has been cancelled.

New Claim 6 has been added as follows:

6. (New) A biocide composition comprising:

3-isothiazolone having the following General Formula 1:

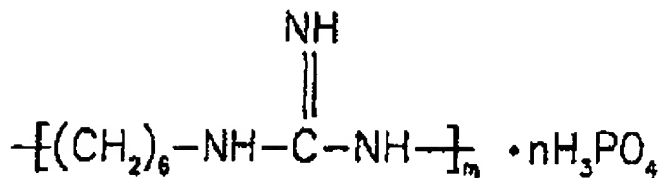
General Formula 1



wherein R is hydrogen or chlorine; and

polyhexamethyleneguanidine phosphate having the following General Formula 2:

General Formula 2



wherein m is an integer from 4 to 7 and n is an integer from 1 to 14.

Claims 2-5 have been amended as follows:

2. (Amended) A biocide composition ~~in accordance with~~ according to claim ~~4~~ 6, wherein the mixing ratio of ~~the above~~ 3-isothiazolone and polyhexamethyleneguanidine phosphate is a weight ratio of 1:1 to 1:65.

3. (Amended) A biocide composition ~~in accordance with~~ according to claim ~~4~~ 6, wherein the ~~above~~ 3-isothiazolone is a mixture in which 3-isothiazolone having R of hydrogen and 3-isothiazolone having R of chlorine are mixed in a weight ratio of 1:20 to 20:1 and the mixing ratio of ~~the above~~ 3-isothiazolone and polyhexamethyleneguanidine phosphate is from 1:1 to 1:4.

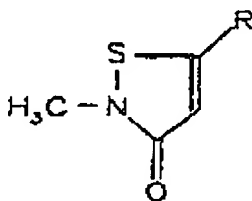
4. (Amended) A biocide composition ~~in accordance with~~ according to claim ~~4~~ 6, characterized in that before the use of the biocide composition, ~~it~~ said biocide composition is mixed with a media selected from the group consisting of cooling water ~~of~~ for an industrial process, disinfectant, paint, antiseptic for latex, additives for cosmetics,

additives for emulsion products, slime control chemicals for textile weaving, paper slime control agent, antiseptic for leather goods, and antiseptic for metal processing oil.

5. (Amended) A sterilizing method ~~of~~ for killing or restraining the growth of bacteria, fungi and/or algae, wherein said method comprises the step of applying by putting a biocide composition of claim 1 into the area that is contaminated by bacteria, fungi and/or algae, wherein said biocide composition comprises:

3-isothiazolone having the following General Formula 1:

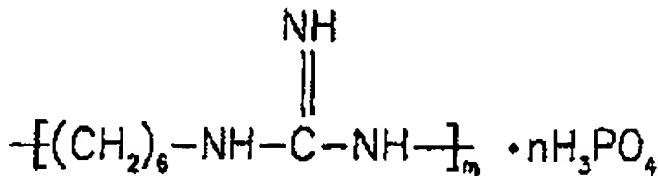
General Formula 1



wherein R is hydrogen or chlorine; and

polyhexamethyleneguanidine phosphate having the following General Formula 2:

General Formula 2



wherein m is an integer from 4 to 7 and n is an integer from 1 to 14.